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ABSTRACT

The purpose of this study was to investigate the effectiveness of CEMREL's Language and Thinking: New Directions Program, a broadly based early learning program in the teaching of basic language and reasoning skills. The program is a hierarchical skills oriented approach which provides a broadly based set of guidelines for teachers; a wide array of manipulatives, picture cards, transparencies, independent worksheets, take-home tasks, and audio tapes; and frequent assessment procedures. Some of the critical skills that are taught in the program are verbal fluency and vocabulary skills; visual and auditory discrimination skills; ordering, classification, and sequencing skills; and skills involved with making predictions, formulating hypotheses, recognizing incongruities and analogies, and synthesizing ideas. The teachers of three four-year-old and three five-year-old Head Start classes were selected for participation and training in this program. Comparison groups were comprised of other Head Start classrooms of the same age and same number of children. The comparison teachers used other recently developed innovative preschool curricula and/or approaches. The Apell Test was administered to all students in a pre-post fashion. Multivariate analysis of covariance indicated significant treatment effects due to the CEMREL curriculum. In addition, there were significant age differences. (Author/DB)

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CEMREL's *Language and Thinking Program:* Some Preliminary Preschool Findings

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CEMREL, Inc.

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The purpose of this study was to investigate the effectiveness of CEMREL's *Language and Thinking: New Directions Program*, a broadly based early learning program in the teaching of basic language and reasoning skills. The program is a hierarchical skills oriented approach which provides a broadly based set of guidelines for teachers; a wide array of manipulatives, picture cards, transparencies, independent worksheets, take-home tasks, and audio-tapes; and frequent assessment procedures. Some of the critical skills that are taught in the program are verbal fluency and vocabulary skills; visual and auditory discrimination skills; ordering, classification, and sequencing skills; and skills involved with making predictions, formulating hypotheses, recognizing incongruities and and analogies, and synthesizing ideas.

The teachers of three four-year-old and three five-year-old Head Start classes were selected for participation and training in this program. Comparison groups were comprised of other Head Start classrooms of the same age and same number of children. The comparison teachers used other recently developed innovative preschool curricula and/or approaches.

The Apell Test was selected as the commercially available test which most closely matched the instructional goals of the program. This test was administered to all students in a pre-post fashion. Multivariate analysis of covariance indicates significant treatment effects due to the CEMREL curriculum. In addition, as expected, there were significant age differences.

The initial results of the analysis of the data are supportive of the need for a preschool program with a strong conceptual base, which also provides teacher-implementation flexibility, and is also supportive of the early intervention efforts. The difference between the gains made by four-year-old experimental classes and the five-year-old experimental classes was significant in favor of the four-year-olds, a result which is in accord with the arguments made by early intervention advocates.

BACKGROUND

Language and Thinking: New Directions is an instructional program which consists of a series of activities packages for the development of essential skills in language and basic concepts development. The complete series of packages is planned to provide instructional activities for preschool through primary grades, including children four to nine or ten years of age.

The general goals of the program are:

- to develop visual and auditory awareness and discrimination;
- to develop the child's use of the language of the classroom;
- to develop verbal fluency and increase vocabulary size;
- to develop ordering, association, classification, and sequencing skills; and
- to provide practice in doing critical thinking skills, drawing relationships, making inferences, making predictions, analyzing problem situations, synthesizing ideas, recognizing incongruities and analogies, making hypotheses and evaluating situations, events, and actions.

Detailed behavioral objectives for each of the eight packages in the Level A series are specified in the teachers' guidebooks.

To describe the packages of the program briefly, they are:

(1) *Let's Start* - An introductory package which explicates the mode of presentation and suggests grouping procedures and bases for the selection of activities for the teacher.

(2) *Colors-Shapes-Sizes* - Presents discrimination and identification, comparative and combinational activities; introduces simple question asking and functional operations that are associated with the *colors, shapes, and sizes* of objects found in the child's environment.

(3) *Directions* - Provides activities for introducing the locations of objects, animals, people, and services that are relevant to the environment in which children live, such as home, school, and the immediate community. Following and giving *directions* are also presented through functional tasks. Left-right discrimination tasks and learning a wide array of words that tell "where" are included in this package.

(4) *Blends* - Combines *Colors-Shapes-Sizes* and *Directions* activities for review or as an entry point for some children who may have acquired the knowledge and skills presented in the preceding packages. *Blends* is suggested for use as the entry point for the Level B series (see below).

(5) *Action* - Pantomime and role playing activities are provided for the discussion and use of verb forms and acquiring skills involved in interpreting pictures, actions and events.

(6) *Functions* - A number of discrimination, identification and classification tasks are presented concerning the use and composition of many items that are readily found in the child's immediate environment. Many of these experiences are of a sensory nature, with provisions for tactile, visual, auditory, and olfactory discriminations being included.

(7) *Classification* - The activities which are presented in this package are built upon the child's examination of attributes that have been presented in preceding packages. The various ways that elements in the environment can be ordered, classified, and reclassified are introduced.

(8) *Relevant Learning Experiences* - A series of activities are provided for additional learning experiences which aid early skills acquisition.

Vocabulary Skills, *Language Skills Builders*, *Creative Writing*, and *Reading Comprehension* are planned for use with upper primary and lower middle-grade children for further expansion and development, and comprise the packages of the Level B series.

The *Language and Thinking: New Directions* Program is based upon theoretical assumptions derived from a variety of sources. The basic knowledge that we have about how individual children learn, when direct instruction or intervention should occur, and how to maintain any effects that result during the early stages for sustained progress as children move through school is still rather meager and subject to continuing study and controversy in the field. There appear, however, to be a number of guidelines for planning systematic instruction of a compatible nature that can be derived from some of the leading theorists that also appear to match observable phenomena derived from the experience of successful classroom teachers of young children. Too often the latter information does not get incorporated into the planning and development of instructional materials. The developers of *Language and Thinking* have attempted to utilize both sources of information.

The selection of content for language and concept development for instruction of children, ages four through ten, may be the one universal of the program. If one studies all of the sources that are available, such as curriculum guides, child development texts, basal reading systems, language texts, nursery school guides, etc., there are very few differences or areas of disagreement concerning what young children should be taught, learn, or with which they should have experience. The major area of disagreement is how and when this content should be taught, learned, or experienced. In other words, under what conditions should the learning occur? In an effort to answer these questions and derive developmental guidelines which seemed appropriate for the content that had been selected, the work of Robert M. Gagne, *The Conditions of Learning* and the application of learning and instructional hierarchies for planning the instructional and learning sequences, has been applied.

The work of Jean Piaget has provided guidelines for the consideration of appropriate tasks for the wide age and grade range for which the program has been developed. The importance of the child's development of the power to distinguish and discriminate, to be able to make decisions and precise abstractions while at the same time enjoying tactile and concrete experiences, has been gleaned from many sources, but the *Montessori Method-Principles, Applications, Terms* was used as a major source. The work with basic school skills development by Carl Bereiter, Siegfried Engelmann, and Ellen Regan has served as another major source, as *Language and Thinking* was conceptualized by CEMREL developers. The Ontario Institute for Studies in Education's *Conceptual Skills Program*, developed by Bereiter-Regan, et al., was used during an early

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field test phase by teachers in St. Louis who are among the resource teachers who participated in all stages of classroom trials for the LATP Program.

The value of the positive classroom atmosphere and contingent reinforcement of children's demonstrated effort and performance has been studied for application within the LATP packages. This effort has been done in association with Instructional Systems Program staff members, Hamblin, Buckholdt, Ferritor, Kozloff and others. The results and effects of their study upon the curriculum developed are recognizable by students of behavior modification. There is no system for using extrinsic rewards or any direct reinforcement strategy, but the procedural guidelines to teachers include suggestions for using praise, recognizing correct responses immediately, setting group contingencies in an effort to help children who are having difficulty, and for using the highly reinforcing materials to maximize the teacher's efforts.

In addition, the recent discussions concerning the teaching of standard English usage to children from divergent language cultural backgrounds by linguists such as Baratz, Shuy, Stewart, et al. have been considered carefully. The suggested instructor-stimulus - student-response patterns have been revised on the basis of evidence derived from observation in classrooms and teacher responses. Finally, there are some properties of the program that cannot be defended by established theoretical or developmental guidelines because they have come about as the result of use over time by teachers who have worked successfully with young children whose intuition or judgment appear to be sound, or in pragmatic terms, their techniques or ideas have worked.

As noted earlier and then briefly described, the bases for a developmental rationale have been broad. This does not mean that there is no system or structure to the program--there is. The selection of applicable guidelines from the aforementioned experts was done on the basis of the areas of compatability among the theories and approaches. To summarize, the following descriptive statements about the LATP program are indicative of its broad rationale:

(1) The program is highly skills oriented.

(2) There is a sequential hierarchic approach to the skills to be learned within each package from a very simple level to more highly complex level.

(3) The program is not intended to be *teacher-proof*. Guidelines for teachers are specific, but there are alternatives for teacher selection of activities and materials in consideration of the individual differences that exist among teachers, e.g., experience, training, creativity, etc.

(4) The Level A program is planned to accommodate an age and grade range from four to six or seven years, preschool through first grade. Suggestions are provided for selecting appropriate activities for children within this wide range.

(5) The primary emphasis is placed on the acquisition of the skills, series of skills, and concepts. This cannot be accomplished without giving attention to the language used in association with this instruction. The teacher is encouraged to be more concerned about the content of the child's response than the structural form of those responses.

(6) The value of manipulation of concrete objects to illustrate and assist with the learning process has high priority in the LATP packages. Many manipulatives are provided with accompanying suggestions for the use of many more.

(7) Monitoring and management of the learning process is required to provide individualization of instruction. Frequent check-up procedures and a usable record keeping system are a part of the LATP packages, also.

(8) The suggested guidelines for the instructional and learning atmosphere are of a positive, reinforcing nature in an effort to insure success for the students and maximize the teacher's efforts.

The *Language and Thinking: New Directions* Program has been developed as the result of several cycles of classroom trial involving classes of children and teachers. The process of developing the packages began with the derivation of an outline of content of early learning concepts and associated perceptual, verbal, and organizing skills. The emphasis of the content selection was placed on skills, activities, and tasks utilized in verbally mediating situations involved in preschool and the early primary grades. This task was performed by a group of kindergarten, first- and second-grade teachers from the St. Louis City Schools, with the ISP curriculum director. The content of this outline served as the basis for formulating instructional objectives, specifications for teaching procedures, and selection of appropriate manipulatives, audio and visual materials. Prototype activities for each attribute, concept, and skill were written by the director and part-time teacher-writers. These activities were tried with classes by resource teachers, who served on a contracted services basis for various periods of time.

The teacher-writers and resource teachers, with clerical and graphic support services, comprised the curriculum staff. Activities were selected on the basis of their appropriateness for the stated objective, the teacher's ability to implement them, and the pupil outcomes. The prototype was tried in classes of kindergarten and first-grade children during the first cycle. Classes of three- and four-year-olds were subsequently added and their teachers represented in the "resource teacher" group. Teachers prepared, suggested, and searched for as many low-cost, concrete items as possible for inclusion. Therefore, a wide variety of manipulatives were tried as activities were prepared. Groups of activities bound in three-ring binders and boxes of "things" were the first approximation to the prototype packages.

The trial and revision of the prototype activities comprised the set of prototype packages which were used in an expanded number of classes for three- through six-year-olds during the following school year. The utilization during this trial period was limited to the resource teachers' classes: three kindergarten, six first-second grade (levels program included both during the course of the year), and two preschool classes. The preparation of the packages at this stage was done by two full-time writers and the director during the summer. Many revisions of isolated segments occurred during the previous trial periods. Throughout the process of the development, revision occurred concomitant with the trial stage that was in process.

OBJECTIVES OF THE INQUIRY

In the summer of 1970, an agreement with a large midwestern school system was informally reached. The most recent version of the *Language and Thinking Program* was to be pilot-tested in several schools and classrooms beginning in the fall of 1970. This pilot test would have featured the typical characteristics of a quasi-experimental design, notably the random assignment of teachers to experimental and control groups. For reasons beyond anyone's real control, the school system was unable to meet its informal commitment. Discussions were held with a number of other school systems, but a suitable arrangement was not forthcoming.

All of the above is included not as an apology for the study to be discussed below, which we at CEMREL think provided us with valuable and timely information, but as an explanation for the lack of design controls in the study to be discussed. Often the contingencies of the real world of the school mitigate against rigorous scientific investigation, but important questions can still be asked and reasonably clear answers obtained in studies lacking, to a degree, experimental credibility.

Agreements with a large southern school district concerning the use of the Instructional Systems Program's behavior modification component had already been put into practice. This school system was willing to install the *Language and Thinking Program* in six preschool classrooms and to designate six other classrooms as comparison classrooms from which data could be collected.

As a result of the manner in which we were forced to obtain a setting for the pilot site, it was, as we noted above, impossible to establish any experimental or quasi-experimental design. The assignment of the

LATP materials to classes was done by school personnel in a non-random fashion. Comparison classes were selected so that equivalent representation by age level would be present. In addition, a number of other innovative approaches to preschool education were being tried in these preschool classrooms; thus, considerable confounding of treatment was present. See Table 1.

INSERT TABLE 1

It must be emphasized that this study is not a comparison among the treatments shown in Table 1. The inferences that may legitimately be drawn, and the generalization of any finding, are admittedly very limited.

We hoped to investigate two issues related to the effectiveness of the LATP materials:

1. Is the *Language and Thinking Program*, in its present stage of development, capable of standing alone, i.e., can it be used by classroom teachers with a minimum degree of direction from CEMREL personnel?
2. Do the students who are exposed to LATP master the objectives of the program as well or better than students not exposed?

METHODS

The six LATP teachers participated in a two-day workshop in November 1970. This workshop, conducted by Mrs. Harriet Doss Willis, Associate Director - Curriculum, introduced the teachers to the rationale, the content, and the procedures of the *Language and Thinking Program*. In addition, the teachers received instruction in the use of the

TABLE I

CLASSES AND TREATMENTS*

School	Experimental (LATP)			Comparison		
	Derek	Grove	Jones	Derek	Grove	Jones
Four-year-old	Forest		Rose Dusten	Elmer (b) McMillan (c,d) Rivers (d)		
Five-year-old	Edwards (a) Torre (a)	Storey		Holloway (b,c,e) Florida (b,c,e)	Collier (b)	

The letters in parentheses following the teacher's name indicate innovative approaches to pre-school education being tried in these classrooms.

(a) Behavior Modification Component (ISP)
(b) SWRL Reading Program
(c) Florida Parent Participation Program
(d) Modified Montessori approach
(e) Distar materials

* The names of the schools and teachers have been changed to preserve anonymity.

Let's Start package. Subsequently these teachers participated in three other one-day workshops which took place at the time each succeeding package was delivered. (Due to the late starting time, and some production difficulties, it was only possible to deliver the first four packages to the experimental teachers.)

With the exception of these workshops the teachers were "on their own." They used the package materials as they thought appropriate. Although guidelines for the teachers made specific recommendations with regard to classroom implementation, the teachers were not constrained to follow them.

No CEMREL-conducted workshops were held for the comparison teachers, but due to their involvement in a variety of other innovative preschool approaches and curricula, Hawthorne effects seem most unlikely.

DATA

During the first week of January 1971 and again during the last week of May 1971, local para-professionals were trained to administer the Apell Test (Assessment Program of Early Learning Levels, published by Edcodyne Corporation, Orange, California). This test is comprised of 50 items designed to measure the child's development in pre-reading, pre-math, and language. At the age level with which we are concerned, it is individually administered on two consecutive days with 25-minute testing sessions. This test was selected as the most appropriate commercially available instrument for evaluating whether or not those instructional objectives specified by the curriculum developers, especially in the area of language development, were being achieved by students using the packages. The basis for selection was a simple match of the curriculum objectives to the test objectives specified by the test developers

of several commercial tests. The para-professionals tested each student in both the experimental and comparison classes. Testers were randomly assigned to classrooms. The individual student cards were sent to Edcodyne for machine scoring.

Edcodyne scores the test and returns for each student 12 subscores which are combined to form three major subscores, as follows:

Subscore	Number of Items	Major Subscore	Highest Possible Score
Visual Discrimination	4		
Auditory Association	4	Pre-Reading	(12)
Letter Names	4		
Attributes	4		
Number Concepts	7	Pre-Math	(13)
Number Facts	2		
Nouns	5		
Pronouns	4		
Verbs	4	Language	(25)
Adjectives	4		
Plurals	4		
Prepositions	4		

In this report we deal only with the major subscores since these are based on at least a more reasonable number of items. Analyses by the component subscores are available to the interested reader.

In order to eliminate "teaching the test," the classroom teachers were not shown the Apell test, nor were copies available, so far as we know, for them to see.

To obtain an estimate of the reliability of the instrument, approximately ten students in each of four classes were selected for retesting by a different testor. This occured within a few days of the pre-test. A similar procedure was used at the time of the post-test. One testor was common to both occasions. Two of the classes used to obtain post-test

reliabilities were the same as those used in January for pretest reliabilities; however, no attempt was made to secure the same subjects for retesting on this occasion.

In order to investigate the usability of the materials, participating teachers were interviewed on two occasions by personnel from the central evaluation staff of CEMREL. They also responded to a questionnaire, developed by the evaluation staff, which was concerned with the effectiveness of the workshop, the recommended instructional procedures, the quality of the materials, and which asked the teachers to inform us of any modifications they made while using the packages. Finally, a local coordinator solicited teacher reactions, comments, and recommendations on a continuing basis.

RESULTS AND CONCLUSIONS

With respect to the usability of the materials, it rapidly became clear that the *Language and Thinking Program* was a product that these teachers both could and wanted to use in their classrooms. The incidence of negative response in any particular was negligible. The fact that the preschool teachers in the system, in a democratic fashion, elected to purchase LATP for use in all classrooms in the subsequent year was conclusive for us. No analysis of interview or questionnaire data is presented since, to paraphrase Andrew Lang, that would mean using statistics as a drunk uses a lamp post, for support rather than illumination.

Table II presents the number of cases per cell and the observed cell means for the three major subscores: pre-reading, pre-math, and language.

INSERT TABLE II

TABLE II

OBSERVED CELL MEANS

		LATP		COMPARISON	
		N=34		N=46	
		Pre-Test	Post-Test	Pre-Test	Post-Test
Four-Year-Olds	Pre-Reading	5.29	6.00	4.93	5.76
	Pre-Math	5.06	6.97	4.72	5.70
	Language	16.26	19.09	15.20	16.96
		N=40		N=42	
		Pre-Test	Post-Test	Pre-Test	Post-Test
Five-Year-Olds	Pre-Reading	5.92	7.85	6.09	7.71
	Pre-Math	6.40	7.57	6.50	7.93
	Language	18.50	21.10	18.31	20.40

Since students had been randomly assigned to classes within the schools, we felt that it was justifiable to use the student as the unit of analysis. Complete cases were used in all analyses.

The Apell test data was submitted to an analysis of covariance using the NYBMUL Computer Program. Table III presents the post-test cell means for the same three sub-scores adjusted for covariation.

INSERT TABLE III

Hypothesis tests for effects due to treatment, age level, and their interaction were run on each of the three major subscores. These analyses are reported in Tables IV, V, and VI. The error term in each instance was within cell variation.

INSERT TABLES IV - VI

It is clear from these analyses that significant effects for treatment, age level, and their interaction were present. We rather suspect that the interaction effect can be accounted for by the presence of the Distar mathematics materials in the comparison, five-year-old cell only. In the absence of an experimental design, however, this line of thought is highly speculative.

As Table IV shows, the principal treatment effect is in the language arts area which, given the nature of LATP, is where one would expect significance. We are very encouraged by this finding, even with all the limitations on interpretation because of the fact that it represents only five months of treatment. Obviously additional information, collected in a more rigorous fashion, is required before any definitive

TABLE III

ESTIMATED POST-TEST MEANS BASED ON FITTING A MODEL OF RANK 4

		LATP	Comparison
Four-Year-Olds	Pre-Reading	6.23	6.27
	Pre-Math	7.20	6.09
	Language	19.50	17.80
Five-Year-Olds	Pre-Reading	7.50	7.34
	Pre-Math	7.27	7.63
	Language	20.50	19.80

TABLE IV

HYPOTHESIS TEST FOR TREATMENT

F-Ratio for Multivariate Test of Equality of Mean Vectors = 3.0125

df = 3 and 153 P Less Than 0.0320

Variable	Hypothesis Mean SQ	Univariate F	P Less Than	Step Down F	P Less Than
Pre-Reading	0.6775	0.2426	0.6230	0.2426	0.6230
Pre-Math	6.6199	1.8789	0.1724	1.6430	0.2018
Language	62.7332	8.8076	0.0035	7.0764	0.0087

Degrees of Freedom for Hypothesis = 1

Degrees of Freedom for Error = 155

TABLE V

HYPOTHESIS TEST FOR AGE LEVEL

F-Ratio for Multivariate Test of Equality of Mean Vectors = 7.2542

df = 3 and 153 P Less Than 0.0002

Variable	Hypothesis Mean SQ	Univariate F	P Less Than	Step Down F	P Less Than
Pre-Reading	41.9529	15.0249	0.0002	15.0249	0.0002
Pre-Math	23.7646	6.7451	0.0104	2.4568	0.1191
Language	74.9856	10.5279	0.0015	3.8173	0.0526

Degrees of Freedom for Hypothesis = 1

Degrees of Freedom for Error = 155

TABLE VI

HYPOTHESIS TEST FOR INTERACTION

F-Ratio for Multivariate Test of Equality of Mean Vectors = 2.4862

df = 3 and 153 P Less Than 0.0628

Variable	Hypothesis Mean SQ	Univariate F	P Less Than	Step Down F	P Less Than
Pre-Reading	0.3740	0.1340	0.7149	0.1340	0.7149
Pre-Math	21.3240	6.0523	0.0150	6.9502	0.0093
Language	9.9675	1.3994	0.2386	0.3970	0.5297

Degrees of Freedom for Hypothesis = 1

Degrees of Freedom for Error = 155

statement can be made, and we are engaged in this effort; but nonetheless, the LATP students did show significant improvement.

It is interesting to note that all of univariate F tests for age levels are significant. Age level is, obviously, a very important variable. As Bloom and others have established, the critical period for growth in most human characteristics is very likely the earliest years of childhood. This study merely confirms the importance of age and, perhaps, indicates again the need for early intervention.

Table VII presents the reliability estimates of the sub-test and total test scores of classes which were retested.

TABLE VII

These were computed from a repeated measures analysis of variance, as outlined in Winer[1], pages 124-131. The estimate of reliability r is given by:

$$r = 1 - \frac{\text{MS residual}}{\text{MS between people}}$$

SIGNIFICANCE OF THE STUDY

At the present time an extended pilot test of the *Language and Thinking Program* is in progress. The current study makes up for many of the deficiencies of the study reported here. Tight experimental control has been established, including the random assignment of classrooms to experimental and control conditions. The current study also features

[1]Winer, B. J., Statistical Principles in Experimental Design, New York: McGraw-Hill, 1962.

TABLE VII

ESTIMATES OF RELIABILITY
PRE-TEST

VARIABLE:	CLASS 1 N=10	CLASS 2 N=10	CLASS 3 N=9	CLASS 4 N=9
Pre-Reading	0.640	0.890	0.851	0.052
Pre-Math	0.191	-0.415	0.789	0.281
Language	0.435	0.622	0.403	0.105
Total	0.800	0.933	0.789	0.420

POST-TEST

VARIABLE:	CLASS 1' N=9	CLASS 2' N=8	CLASS 3' N=8	CLASS 4' N=9
Pre-Reading	0.788	0.793	0.626	0.438
Pre-Math	0.633	0.564	0.816	0.408
Language	0.802	0.803	0.724	0.514
Total	0.888	0.912	0.813	0.719

multiple experimental conditions so that we can investigate the importance of how and for how long the teachers use LATP. In addition, Unit Mastery Learning Criterion Tests have been developed, not only to provide us with information concerning the degree to which each package is successful but to provide the teacher with more immediate feedback on her students' progress as well.

Yet the importance of this study reported here should not be minimized. In terms of the continuing evaluation of a new curriculum, this study provided us with information about the usability, and some preliminary indications about the instructional effectiveness, of the *Language and Thinking Program*. This information has enabled us to proceed, with some confidence, to the production level necessary for extended pilot tests. The findings of this study were supportive of the need for a preschool program with a strong conceptual base and which allows for teacher-implementation flexibility.

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